

REMARKS

Claims 1-8 and 10-16 stand in the present application, claims 1-6 and 8 having been amended, original claim 9 having been canceled and new claims 10-16 having been added. Reconsideration and favorable action is respectfully requested in view of the above amendments and the following remarks.

In the Office Actions, the Examiner has objected to the drawings as failing to comply with 37 CFR 1.84 because they include a number of deficiencies. As noted above, Applicant has amended the specification in order to correct a number of the drawing problems. With respect to Figure 6B, however, Applicant has requested permission in a separate paper filed concurrently herewith to revise Figure 6B to correct the reference numeral for the outer cylindrical cover to --11-- from "12." The correction will be made to the formal drawings upon receipt of permission from the Examiner and an indication of allowable subject matter. In view of the above, all of the Examiner's drawing objections are believed to have been overcome.

The Examiner has rejected claims 1-9 under 35 U.S.C. § 102(e) as being anticipated by Watanabe et al. In view of the above-described claim amendments, the Examiner's § 102 rejection of the claims is believed to have been overcome, as will be described in greater detail below.

Applicant's invention is directed to a structure for fixing outer and inner covers 11 and 12, of a gas sensor, on an outer side wall of an end portion of housing 10 (see Figures 1-9 of the present application). In addition, Applicant has disclosed another embodiment of the present invention in which a structure that ensures a positioned relation of outer and inner covers 11 and 12 to housing 10 enables outer and inner

covers 11 and 12 to be installed on housing 10 using the annular extension wall 692 formed on a bottom end surface of the housing 10 (see Figure 10 of the present application).

In contrast, Watanabe et al. discloses a joint structure in which the outer and inner covers 21 and 22 are installed in the groove 45 of the sensor mount (i.e., a housing) 41. [Thus, the cited reference fails to teach or suggest fixing the outer and inner covers on an outer side wall of an end portion of the sensor mount, as now more clearly recited in amended claims 1 to 7 of the present application. The cited reference also fails to teach or suggest fixing the outer and inner covers by welding an extension formed on the sensor mount, as recited in amended claim 8 of the present application.]

With respect to claim 9 (now amended claim 8), the Examiner states in the Office Action that Watanabe et al. discloses that the extension is welded to the shoulders of the inner and outer cylindrical covers. Applicant respectfully disagrees. Only the inner and outer cylindrical covers of Watanabe et al. are welded to each other. The welding of the extension is not taught or suggested in Watanabe et al. at all.

Accordingly, since the cited reference does not teach or suggest Applicant's invention as now more clearly recited in amended claims 1-8, all of these claims are believed to be in condition for allowance. In addition, in order to more completely define Applicant's invention new dependent claims 10-16 have been added which correspond respectively from original claims 1-7. These claims are believed to further patentably define over the cited reference by reciting that a portion of at least one of the outer and inner covers is welded to the housing.

does this hold patentable w/e, if?

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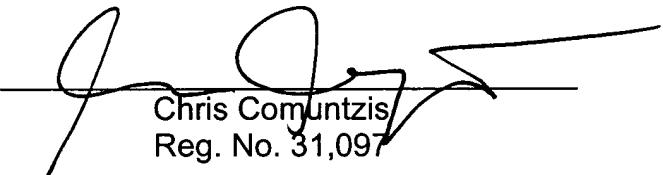
Therefore, in view of the above amendments and remarks, it is respectfully requested that the application be reconsidered and that all of claims 1-8 and 10-16, standing in the application, be allowed and that the case be passed to issue. If there are any other issues remaining which the Examiner believes could be resolved through either a supplemental response or an Examiner's amendment, the Examiner is respectfully requested to contact the undersigned at the local telephone exchange indicated below.

Attached hereto is a marked-up version of the changes made to the specification and claim(s) by the current amendment. The attached page(s) is captioned "Version With Markings To Show Changes Made."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE
IN THE SPECIFICATION

Please replace the paragraphs beginning at page 2, line 7, with the following rewritten paragraphs:

A gas sensor 9 includes a housing 10, a cup-shaped sensing element 29, an outer cover wall 91, and an inner cover wall [all] 92 which have dimples 911 and 921 formed in bottoms 910 and 920 thereof. The inner cover wall 92 is fitted within the outer cover wall 91 in engagement of the dimple 921 with the dimple 911.

The housing 10 has a small-diameter portion 15 formed on an end portion 106 thereof. The outer and inner cover walls 91 and 92 have open end portions 915 and 925 which are so formed as to be lapped one over the other when the inner cover wall [all] 92 is fitted within the outer cover wall 91 in engagement of the dimple 921 with the dimple 911. The open end portions 915 and 925 are welded as indicated at 14, to the periphery of a side surface 151 of the small-diameter portion 15 of the housing 10.

Please replace the paragraph beginning at page 8, line 18, with the following rewritten paragraph:

The gas sensor 1 generally includes a hollow cylindrical housing 10, a sensing element 2, and a double walled protective cover assembly 70. The sensing element 2 is retained by an insulation porcelain 22 within the housing 10. The protective cover assembly 70 is installed on a side surface 106, as shown in Fig. 3(a), of an end portion of the housing 10 to cover a tip portion (i.e., a sensing portion) 21 of the sensing

element 2 projecting outward from an end surface 107 of the housing 10. The protective cover assembly 70 is made up of an outer cylindrical cover 11 and an inner cylindrical cover 12 disposed within the outer cover coaxially with each other. The outer and inner covers 11 and 12, as clearly shown in Figs. 2 and 3(b), have open end portions 115 and 125 each of which has an L-shape in cross section. The outer and inner covers 11 and 12 have body portions 118 and 128, respectively. The body portion 128 of the inner cover 12 is, as clearly shown in Fig. 1, disposed within the body portion 118 of the outer cover 11 in a non-contact form. The open end portions 115 and 125 expand outward to form annular shoulders 110 and 120. The shoulder 120 is so designed as to be fitted on the shoulder 110 in line engagement therewith to secure a given positional relation between the outer and inner covers 11 and 12 to define a lap of the open end portions 115 and 125 sufficient to be firmly attached to the periphery of a side surface 151, as shown in Fig. 3(a), of a small-diameter portion 15 of the housing 10 [firmly].

Please replace the paragraph beginning at page 9, line 24, with the following rewritten paragraph:

The outer and inner covers 11 and 12 have formed in the body 25 portions 118 and 128 thereof, as respectively shown in Figs. 4b [(a)] and 4a [(b)], a plurality of gas holes 180 through which the gas to be measured flows into a gas chamber defined inside the inner cover 12. The outer and inner covers 11 and 12 also have formed in bottoms thereof holes 190 coinciding with each other.

Please replace the paragraph beginning at page 10, line 10, with the following rewritten paragraph:

The open end portions 115 and 125 of the outer and inner covers 11 and 12, as described above in Fig. 3(b), expand outward to define the annular shoulders 110 and 120. The annular shoulders 110 and 120 have corners 111 and 121 which define an annular line contact 13, as shown in Fig. 2, on a horizontal plane extending perpendicular to a longitudinal center line of the cover assembly 70 when the outer cover 11 is fitted on the inner cover 12. Instead of the annular line contact 13, the shoulder 120 may engage the shoulder 110 at a plurality of discrete point contacts. The open end portion 115 of the outer cover 11 also has, [have,] as shown in Fig. 3(b), an inner upright side surface 116 and an outer upright side surface 117. Similarly, the open end portion 125 of the inner cover 12 also has [have] an inner upright side surface 126 and an outer upright side surface 127. The inner upright side surface 126 of the inner cover 12 is, as shown in Fig. 2, attached to the side surface 151 of the small-diameter portion 15 of the housing 10 in surface contact. The outer upright side surface 127 of the inner cover 12 establishes a surface contact with the inner upright side surface 116 of the outer cover 11 when the inner cover 12 is fitted within the outer cover 11. Further, the inner cover 12 has an end 124 which, as shown in Fig. 2, engages the horizontal surface 152 of the small-diameter portion 15 of the housing 10 directly.

Please replace the paragraph beginning at page 11, line 14, with the following rewritten paragraph:

First, the inner cover 12 is fitted on the small-diameter portion 15 of the housing 10 in direct contact of the inner upright side surface 126 with the side surface 151, and with the upper end 124 of the inner cover 12 forced into contact with the horizontal surface 152 of the housing 10.

Please replace the paragraph beginning at page 12, line 16, with the following rewritten paragraph:

The shoulders 110 and 120 of the outer and inner covers 11 and 12 may alternatively be, as shown in Fig[s.] 6(a) [and 6(b)], formed closer to the bottoms of the inner and outer covers 11 and 12.

Please replace the paragraph beginning at page 13, line 13, with the following rewritten paragraph:

The outer cover 31 is put on the inner cover 32 with an inner wall 314 of the open end portion 315 lapped over an outer wall 316 of the open end portion 325 of the inner cover 32. The outer cover 31 abuts at an end thereof against an outer corner 322 of the second shoulder 360 of the inner cover 32. This establishes a given positional relation between the outer cover 31 and the inner cover 32. Specifically, the second shoulder 360 of the inner cover 32 works to position [of] the end portion 315 of the outer cover 31 relative to the housing 10, thereby securing a lap of the open end portions 315 of the outer and inner covers 31 and 32 which is sufficient to be welded, as indicated at 14 in Fig. 7(a), around the periphery of the side surface 151 of the small-diameter portion 15 of the housing 10. Other arrangements are identical with those of the first embodiment, and explanation thereof in detail will be omitted here.

Please replace the paragraph beginning at page 15, line 3, with the following rewritten paragraph:

Specifically, the outer cover 51 has a vertically extending open end portion 515 which has a length greater than that of the open end portion 115 in the first

embodiment. The shoulder 520 of the inner cover 52 has an end 522 placed in contact with the end surface 107 of the housing 10. The outer cover 51 is fitted on the small-diameter portion 15 of the housing in contact of an inner upright side surface 516 thereof with the side surface 151 of the housing 10, thereby securing the location of the outer cover 51 relative to the housing 10. The outer cover 51 is welded as shown at 14, at the open end portion 515 thereof directly to the periphery of the small-diameter portion 15 of the housing 10 and holds the shoulder 520 of the inner cover 52 between the shoulder 510 thereof and the end surface 107 of the housing 10. The shoulder 520 of the inner cover 52 is, like the first embodiment, placed in line contact with the shoulder 510 of the outer cover 51, thereby securing a lap of the open end portions 515 of the outer cover 51 over the side surface 151 of the small-diameter portion 15 of the housing 10 which is sufficient for providing a firm joint of the protective cover assembly 70 to the housing 10.

IN THE CLAIMS

1. (Amended) A gas sensor comprising:
 - a hollow cylindrical housing having an open end;
 - a sensor element disposed within said housing, said sensor element having a sensing portion projecting from the open end of said housing; and
 - a cover assembly made up of an outer cylindrical cover and an inner cylindrical cover each of which includes an open end portion and a body portion, the body portion of the inner cylindrical cover being disposed within the body portion of the outer cylindrical cover in a non-contact fashion, the open end portion of at least one of the outer and inner cylindrical covers having a shoulder which is placed in contact with

the open end portion of the other cylindrical cover to establish a positional relation between said cover assembly and said housing which defines a portion of at least one of [portions of] the outer and inner cylindrical covers fixed [installed] on an outer peripheral end side wall of said housing continuing from the open end thereof.

2. (Amended) A gas sensor as set forth in claim 1, wherein the open end portion of each of the outer and inner cylindrical covers has a side end wall greater in diameter than the body portion and a shoulder formed between the side end wall and the body portion, the shoulder of the inner cylindrical cover being placed in contact with the shoulder of the outer cylindrical cover to establish a positional relation between the open end portions of the outer and inner cylindrical covers which defines a given lap of the side end walls of the outer and inner cylindrical covers which is joined to the outer peripheral end side wall of said housing continuing from the open end thereof.

3. (Amended) A gas sensor as set forth in claim 1, wherein said housing has a large-diameter portion and a small-diameter portion on which the outer peripheral end side wall is defined and a step formed between the large-diameter portion and the small-diameter portion, and wherein the open end portion of the inner cylindrical cover has a side end wall bent outward to define the shoulder, the shoulder being placed in contact with the step of said housing while the open end portion of the outer cylindrical cover is placed in contact with the shoulder of the inner cylindrical cover to defines a lap of the open end portions of the outer and inner cylindrical covers installed on the outer peripheral end side wall of said housing.

4. (Amended) A gas sensor as set forth in claim 1, wherein the open end portion of the outer cylindrical cover has a side end wall and the shoulder formed between the side end wall and the body portion, the open end portion of the inner cylindrical cover having an end wall bent outward to define a flange which is placed in contact with a surface of the open end of said housing and which engages at an end thereof with the shoulder of the outer cylindrical cover to secure a given lap of the open end portion of the outer cylindrical cover over the outer peripheral end side wall of said housing for installation of said cover assembly on said housing.

5. (Amended) A gas sensor as set forth in claim 1, wherein the open end portion of each of the outer and inner cylindrical covers has a side end wall and a shoulder formed between the side end wall and the body portion, the side end wall of the inner cylindrical cover abutting at an end thereof on the open end of said housing, the shoulder of the inner cylindrical cover being placed in contact with the shoulder of the outer cylindrical cover to secure a given lap of the side end wall of the outer cylindrical cover over the outer peripheral end side wall of said housing for installation of said cover assembly on said housing.

6. (Amended) A gas sensor as set forth in claim 1, wherein the shoulder of the open end portion of the one of the inner and outer cylindrical covers is placed in contact with the open end portion of the other cylindrical cover on a plane extending substantially perpendicular to a longitudinal center line of said cover assembly to secures areas of the outer and inner cylindrical covers installed on the outer peripheral end side wall of said housing.



8. (Amended) A gas sensor comprising:

a hollow cylindrical housing having an open end in which a groove is formed;
a sensor element disposed within said housing, said sensor element having a sensing portion projecting from the open end of said housing;

a cover assembly made up of an outer cylindrical cover and an inner cylindrical cover each of which includes an open end portion and a body portion, the body portion of the inner cylindrical cover being disposed within the body portion of the outer cylindrical cover in a non-contact fashion, the open end portions of the outer and inner cylindrical covers having outwardly extending shoulders, respectively, which are placed in contact with each other and fitted within the groove of said housing; and

an extension formed around the groove of said housing, said extension being bent to urge the shoulders of the outer and inner cylindrical covers into engagement with each other to install said cover assembly on said housing,

wherein said extension is welded to the shoulders of the inner and outer cylindrical covers so that a tip of the weld lies within a thickness of the shoulder of the inner cylindrical cover.

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